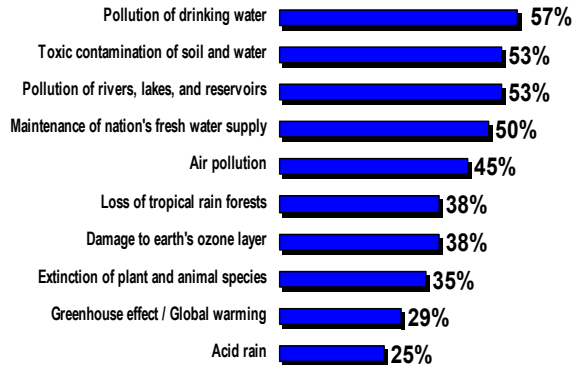


Earth: The Water Planet

Earth is a truly unique planet in its abundance of water. Water exists in the Earth system in all three phases: solid, liquid, and gaseous. The functioning of the living biosphere is dependent on water and variations in its availability.

Poll percentage that worried "a great deal" about:



Ranking of environmental concerns (taken from Gallup News Service: *Americans Sharply Divided on Seriousness of Global Warming*, March 25, 2002)

The legacy of climate research had predominantly evolved from concern for global warming in relation with the increase in the concentration of greenhouse gases—primarily carbon dioxide—in the Earth's atmosphere. However, a recent Gallup Poll (March 25, 2002) suggests that a shift in societal concern places water quality and availability above global warming in terms of pressing, environmental issues. Water is indeed abundant, but it is not evenly distributed over the globe or always in a form amenable for human use. The impacts of climate change and variability on the quality of human life occur primarily through changes in the water cycle. The cycling of water is intimately linked with energy exchanges among the atmosphere, ocean, and land that determine the Earth's climate and cause much of natural climate variability. As stated in the National Research Council's report on *Research Pathways for the Next Decade* (NRC, 1999): "Water is at the heart of both the causes and effects of climate change." Next to assessing the potential for global warming, determining the consequences of global change for weather, precipitation, and hydrologic regimes is the paramount challenge of climate science.

Science Questions

Variability

What are the trends and variability in the precipitation and the soil-moisture storage elements of the water and energy cycles?

Fluxes and Feedbacks

How can the key pathways of water and energy within the atmosphere and between the atmosphere and the Earth surface be quantified? How are these pathways influenced by observed or projected climate change?

Predictability

What are the limits of predictability of precipitation, soil moisture, and other hydrologic variables under a variety of climate conditions or transient climatic anomalies?

Link to Biochemistry

What are the mechanisms and the timescales of interactions between terrain, soil, vegetation, precipitation and hydrology? What are the processes that link the water, energy and carbon cycles?

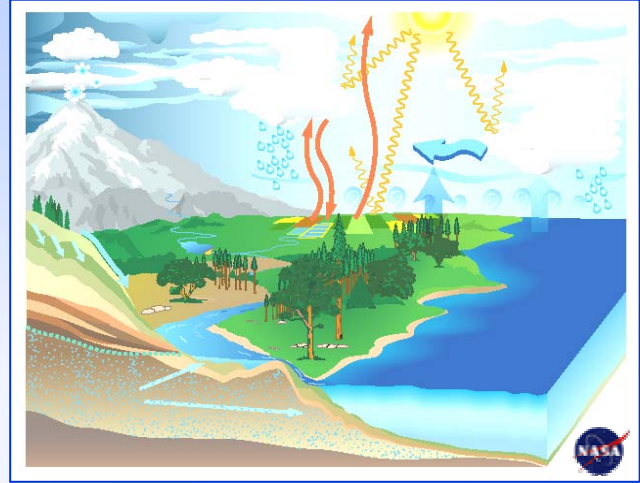
Enabling Improved Prediction

How can climate and weather forecasts be improved by incorporating new global observations of clouds, precipitation and soil moisture? How can data assimilation methods improve initial conditions and the formulation of models?

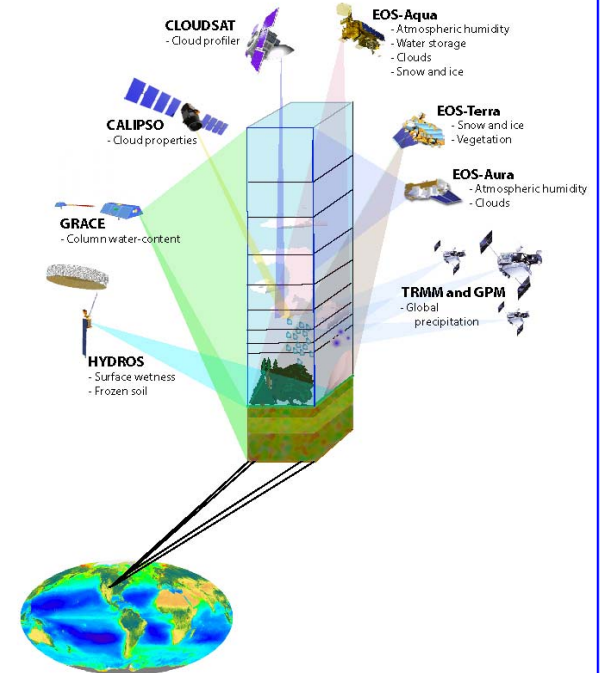
GOAL:

Characterize and predict variations in the global water cycle and the replenishment of water resources

The Water and Energy Cycles



NASA's Experimental Missions and Space Measurements

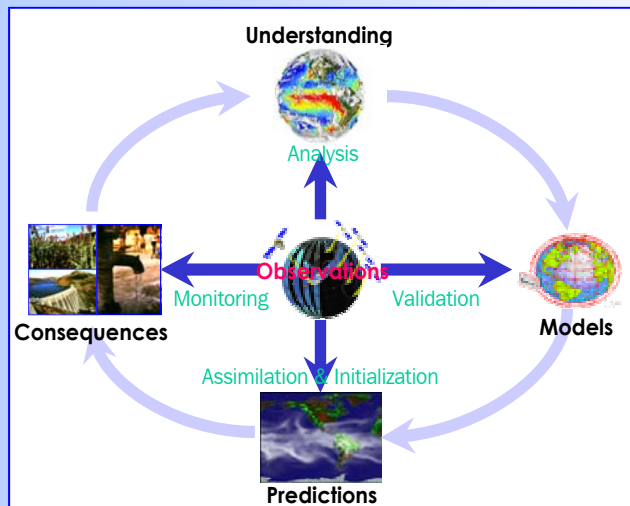


Who are we:

WatER's Integrating Objective

Advance integrating models of the water and energy cycles at global scales that have the capability to predict variations in precipitation and hydrologic variables; and exploit improved observations of precipitation and soil moisture

NASA's Integrating Research



- Chair:
Professor Rafael Bras, MIT
- NASA HQ:
Dr. Jared Entin
- Scientific Coordinators:
–Dr. Paul Houser
–Dr. C. Adam Schlosser
- Program Assistant:
–Debbie Belvedere

Coordinating activities
facilitated at
Goddard Space Flight Center
and task force of
academic and NASA experts
to guide the
scientific planning process

For further information please contact::

Dr. Paul R. Houser
houser@hsb.gsfc.nasa.gov

Dr. C. Adam Schlosser
adam@hsb.gsfc.nasa.gov

NASA/Goddard Space Flight Center
Code 974
Greenbelt, MD 20771
Phone: 301-614-5689

NASA'S Water and Energy Research (WatER) Initiative



“Water is at the heart of both the causes and effects of climate change.” (NRC, 1999)